A FLEXIBLE MODEL OF DEMAND FOR HEALTH CARE SERVICES IN KENYA

BY

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DECLARATION

This Research Paper is my original work and has not been presented for a degree in any other university

Signed _____ 27-08-'04

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This Research Paper has been submitted for examination with our approval as university supervisors

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DEDICATION

Dedicated to **Irene** and our children, **Kennedy** and **Lessing**.

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ABSTRACT

This paper analyzes demand for health care in rural Kenya. It was motivated by desire to analyze the effects of user fees on utilization of health care following the introduction of cost sharing in government health facilities. A discrete choice model of health care demand is proposed and maximum likelihood estimation of the model performed. The study utilizes data from Welfare Monitoring Survey 1997. The main finding is that demand for health care decreases with increase in user fees.

CHAPTER ONE: INTRODUCTION

1.1 Overview

At independence in 1963, the Kenya government inherited a heterogeneous health delivery sector that consisted of a mixture of public and private activities. The government provided the bulk of curative care through the ministry of health facilities. It also financed much of preventive programs. The ministry of health accounts for 56% of the health facilities and employs 69% of health personnel in the health sector. The private sector accounts for the remaining percentages (Collins et al. 1995).

The private sub-sector providers include religious missions, private physicians including government physicians who maintain part-time private practice, pharmacists, traditional healers, midwives, and retailers of nonprescription drugs. The role of private sub-sector in health delivery is by no means less and in fact has expanded to cover rural areas (Mwabu et al. 1998).

Prior to independence, access to modern health care was limited due to socioeconomic circumstances of the population. During the pre-independence period, patients paid a small fee for services received. However this policy did not last long because after independence the new government embarked on a politically correct policy of eradicating sickness among other goals. To achieve this goal, a policy of equal access was necessary which meant health care was to be provided free of charge.

Thus, until 1989 curative and preventive services in government health facilities were provided to the public free of charge. Perhaps the other reason why the post-

independence government saw it necessary to support free health care services was most importantly, due to an economy that was registering impressive growth. In 1963, the population stood at 8.9 million but soon begun to grow exponentially reaching 18.4 million in 1984 and 24.5 million by 1993 (Collins et al. 1995). The rapid growth of the population was partly due to decline in death rate and steady birth rate. During the first two decades after independence, Kenya's per capita output grew by about 3% each year. This led the government to invest massively in basic services including health.

However private sector health care services have all along been provided for a fee. The government has even subsidized that fee especially for preventive services in some missionary facilities. As much as 70% costs is recovered with fees in mission facilities in Africa (World Bank 1987). Of all expenditures on health in Africa, private out-of-pocket expenditure accounts for 43% compared to 37% for government while donors account for 20% (Shaw et al. 1995).

1.2 Policy Reform

Although the post-independence government embraced the policy of free health care, the experience of the first two decades showed that the policy was unsustainable. Worldwide recession in late 1970s and early 1980s and severe drought experienced in 1984 further contributed to declining economic performance. Rapid population growth and oil price shocks meant that the government could not continue providing free health care services. While total recurrent government expenditure rose from KShs 9.2 billion in 1979/80 fiscal year to KShs 34.8 billion in 1991/92 fiscal year, it actually fell by 13% after adjusting for inflation. Furthermore, despite the ministry of health's recurrent expenditure

rising from KShs 859 million in 1979/80 fiscal year to KShs 2.957 million in 1991/92 fiscal year, it declined as a proportion of total government recurrent spending through ministries from 9.3% to 8.5% over the same period. It reached a low of 7.4% in 1988/89 fiscal year (Collins et al. 1995). Table 1 summarizes these figures.

Table 1. Government of Kenya and Ministry of Health Recurrent Expenditure

Fiscal Year	88/89	89/90	90/91	91/92	92/93	93/94	%change: FY 88/89 to:-	
							FY 1992/93	FY 1993/94
Health[1]	2,274	2,301	2,576	2,957	3,390	4,184	49.1	84
All GOK Ministries[1]	30,791	29,153	32,944	34,751	41,587	54,659	35.1	77.5
Health as % of GOK Expenditure	7.40%	7.90%	7.80%	8.50%	8.20%	7.70%		
Health[2]	2,984	2,661	2,576	2,472	2,223	1,879	-25.5	-37
All GOK Ministries[2]	40,413	33,724	32,944	29,051	27,267	24,547	-32.5	-39.3
Provincial Hospitals[1]	382	348	381	443	503	577	31.5	51
District Hospitals[1]	812	937	1,093	1,261	1,261	1,383	55.2	70.2
Primary Health Care[1]	488	436	512	652	729	1,066	49.4	118.3
Provincial Hospitals[2]	502	402	381	371	330	259	-34.3	-48.3
District Hospitals[2]	1,066	1,083	1,093	1,054	827	621	-22.5	-41.8
Primary Health Care[2]	641	504	512	545	478	479	-25.4	-25.3

1 Actual KShs Millions
2 Constant 1990 KShs Millions
Source: Adapted from Collins et al 1996

The fall in real per capita spending coupled with the effects of other factors such as rugged terrain, illiteracy, rapid urbanization, and inefficient transportation and communication systems further made it difficult for the centralized public health care delivery system to provide free health care services. The declining share of government expenditures on health translated into real decline of public resources for the health sector. Inefficiency in health service delivery added to the problem of providing free

health care. The tendency in government had been to allocate the few available resources to high cost relatively ineffective health care. This was because a large and growing share of public spending on health had been devoted to urban hospitals thus further limiting the scope for expanding services into under-served rural areas.

By mid 1980s, there were numerous signs of deterioration of government health services, poorly paid and unmotivated staff, poor equipment, and shortages of drugs. The problems facing the health sector worsened further with the implementation of SAPs that called for reduced government spending especially in the social services. The inability of the government to provide adequate and quality health care services led to the introduction of cost sharing in December 1, 1989.

1.3 Research Problem

As the government sought to mobilize additional resources through cost recovery so as to enhance efficiency and equity in the health sector, questions were raised regarding the impact of user fees on health facility utilization especially for the poor and the vulnerable groups. The support for user fees was strongly influenced by the realization that in essence there had been no free care since patients had to procure drugs and medical supplies from the private sector because such services were in short supply in government health facilities. Studies in Kenya and other parts of Sub-Saharan African countries that had implemented cost sharing showed that patients were willing to pay for the services provided this was accompanied by increased quality of care. Evidence of ability and willingness to pay and actual payment abound. In rural Kenya the average cost for a visit to a traditional healer was KShs 46, far more than the average charge of KShs 14.2 for treatment in private health facilities (Shaw et al. 1995).

However, despite the introduction of the cost-sharing program, the precise effect of the policy on health care demand still remains unclear. Furthermore, despite numerous studies on health care demand in developing countries, few studies have attempted to estimate price elasticity of health care demand using flexible price-coefficient models. This study aims at bridging this gap.

1.4 Objectives of the Study

The broad objective of this study is to determine the effects of user fees on the utilization of health care services in Kenya. The specific objectives are to:

1. Determine socioeconomic characteristics of patients and of the facilities that influence choice of health care provision option.
2. Estimate the price and income elasticity of demand for medical care controlling for other variables of interest.
3. Carry out simulations on effects of selected policies on health service utilization.
4. Make policy recommendation based on study findings.

1.5 Significance of the Study

This study employs a flexible behavioral model of discrete health care demand for Kenya. In so doing it rejects the assumption that utility is an additively separable function of health and non-health consumption. Additive separable assumption imposes undue restriction in that it constrains the price coefficient to equality across alternatives. In the additive separable model specification only a single price coefficient (choice j) is

estimated. The own price elasticity of demand of the other choices (choice k---J) are mechanically related to price elasticity of choice j. When a price-coefficient flexible model is used, no such mechanical relationship exists between choices and price elasticity are independent. Studies done in Kenya so far (Mwabu et al. 1993, 1995) have used model specification that constrains price coefficient to equality across alternatives. In the light of this, this study will contribute to a clearer understanding of the effects of user fees on demand for health care.

1.6 Organization of the Study

Following chapter one, chapter two presents a review of literature. The chapter specifically looks at the theoretical and empirical studies on demand for health care. Chapter three provides the research methodology and the estimation model used in the study, while chapter four present the empirical estimation results. Chapter five summarizes and concludes the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Economists began modeling demand for health care in 1960s. Early demand models were simple reduced-form equations whose explanatory variables were price of the particular service, price of alternative services, and household income and tastes. Later day models incorporated time cost of obtaining the particular service and demographic characteristics of the patient such as education, age, sex, etc. Quality of health care has since been recognized as an important factor in health care demand modeling.

Another important development in this field of inquiry is the discovery that demands for health care is a discrete choice. This led to change of modeling style from reduced-form formulation to discrete choice demand modeling which is the current practice.

2.2 Review of Literature

Gertler et al. (1990) carried out a study of health care demand in Cote d'Ivoire and Peru to investigate the impact of user fees on utilization of health care, revenue generation and welfare. It focused on household decision to seek care and the choice of provider.

The study found that there was almost no private health care sub-sector in rural Cote d'Ivoire. Majority of ill or injured people sought care initially from government hospitals, clinic or did not obtain any professional medical treatment. There were no user fees in government health facilities. The price of care was the opportunity cost of travel time and time spent in obtaining care. Variation in travel time to facility was sufficient for identification of model parameters. Opportunity cost of time was calculated as product of round-trip travel time and village-level agricultural wage since the majority of the rural

people were farmers. In the absence of monetary prices, opportunity cost of time ration the market for medical care.

A nested multinomial logit (NMNL) model was estimated using full information maximum likelihood. Results showed that hospital and clinic were close substitutes and that relative prices of the alternatives were relevant for the choice of provider. Arc price and travel time elasticity of demand was calculated by income quartiles. The price elasticity of demand was found to fall with increase in income an indication that user fees are therefore regressive in that they reduce utilization of medical care by the poor substantially more than by the rich. The travel time elasticity showed that people are sensitive to time price. The study concludes that the opportunity cost of time is a barrier to health care for the poor.

In the Peruvian case (Gertler et al. 1990), the health sector was found to be heterogeneous with a large private health care sub-sector alongside government facilities. User fees were in use albeit low in government facilities. The same estimation procedure as applied on the Cote d'Ivoire data was used. The Peruvian results found similar findings as those in Cote d'Voire. The price elasticity of demand fell with increase in income and confirms the regressive effects of user fees.

Unlike most health care demand studies that are based on country rural set up, Gertler et al. (1987) were interested in studying demand for health care in urban Peru. The focus of the study was on the effects of user fees on cost recovery and welfare (utilization levels).

Using data from a 1984 Peruvian household survey (ENNSA), the study established that the health sector consisted of a mixture of public and private health care providers and user fees were charged in both the sub-sectors.

In order to model health care demand, the authors employed an adaptation of McFadden's (1981) random utility maximization (RUM) analysis. The utility function was specified to be additive of health, non-health consumption, and opportunity cost of travel time. In addition they rejected a linear utility function arguing that such a function imposes restriction that income has no effect on choice of provider and the marginal rate of substitution is constant meaning that health is not a normal good. They also observed that to allow the coefficient on the consumption term vary with alternative violates maximization of a stable utility function. Hence their discrete choice specification of the demand function was estimated using parsimonious flexible functional form.

To avoid the problem associated with the assumption of independence of irrelevant alternatives (IIA), the demand function took on NMNL form which allows correlation between facilities that share common attributes. Maximum likelihood method was used to estimate parameters of the NMNL. The results of estimation showed that the price and income to be important factors in the demand for health care as indicated by the significant coefficients on both the log- consumption terms. When the arc price elasticity were estimated, the results showed that they were negative over all the prices and income groups. The implication is that demand for medical care is more elastic at lower income and at higher prices. For the highest income quintile demand was found to be completely

inelastic. A negative coefficient on time cost implied that increases in non-monetary access costs reduce demand for health care.

Mwabu et al. (1993) sought to find out the effect of quality improvement on utilization of health care facilities. The study was a timely landmark given that the country was in the middle of a World Bank prescribed health care sector financing reform. Their study used household and health facility data sets from a Kenya rural district. The survey data established that households faced four distinct health care provider alternatives namely government facilities, private hospitals, mission hospitals and self-care.

Empirical analysis of the relationship between medical care quality and medical care demand was conducted along side other factors. Among the measures of facility quality considered were drugs, medical staff and diagnostic equipment in the discrete choice demand estimation that they based on the assumption that patients maximize expected utility. The utility function was specified as log- linear in health status and consumption. The coefficients on choice-specific variables are constrained to equality across alternatives. The study found quality of medical care to be an important determinant of successful health care sector reform. User fees reduce demand while drugs, a quality variable, increase demand.

Dor et al. (1993) looked at the health care delivery system in Cote d'Ivoire. The main purpose of their study was to identify the impact of travel time as well as other economic variables on health care utilization in rural Cote d'Ivoire.

There were no user charges in 1993 in Cote d'Ivoire. Information on medical consumption such as number of visits to each provider, expenditures on consultation (if any) and drugs was collected. Socioeconomic information on types of health care facilities available, travel time to provider etc were also collected. Nurse and doctor services were the only two alternatives available to the people. A multinomial logit model of health care demand was estimated to analyze the choice of alternative health care provider. The results showed that travel-time price were significant, as were cross-time price effects. The authors pointed out that the policy of free medical care was in fact regressive in that most benefits accrued to high-income urban dwellers. Patients in rural areas incurred considerable access costs associated with queuing, lengthy travel times and transportation. Nurse and doctor services are substitutes rather than complements.

To find the elasticity of the probability of choosing a specific provider with respect to time price, Dor et al specified a mode that encompasses cross time-price effects. This enabled them to calculate own time-price elasticity as well as cross time-price elasticity. The calculated income and time-price elasticity confirmed established results that own time-price effects are negative and cross-time effects are generally positive and that in the absence of user fees, travel time acts as a rationing mechanism in the health care market. In conclusion Dor et al observed that absence of user fees does not guarantee equal access for all. Those living further from health care facilities have restricted access due to the private out-of-pocket costs. The demand for health care in rural areas could be greatly increased if regional distribution of the facilities was improved, the improvement being financed by user fees.

The study by David et al. (2002) examined how changes in the pricing and quality of services affect health care utilization. As demand for health care is a discrete choice, the study employed a two-level nested multinomial logit model that allowed them to estimate cross-price elasticity that varies for options. Their functional form for prices and income is such that the coefficients are equal across options. This constrains marginal utility of income to be the same across alternatives. They argued that having radically different marginal utilities across options is implausible.

The results showed that own time-price elasticity of demand was high indicating that travel time significantly influences consumption of medical services in rural Tanzania. They also found that cross time-price elasticity are high between public clinics and private clinics. This indicates that as the price of public health care services rises there will be a substantial substitution into private health care services. The study also found that the poor were far more responsive to prices than the non-poor. Thus user fees have a much greater impact on service utilization of lower income households.

On quality effects, the authors found that there is high demand for public clinics and dispensaries in those facilities with high quality ratings for drug availability and the health clinic environment as well as availability of a doctor/nurse variable. The study concluded that raising quality of health care has the effect of increasing the probability of utilization of the health facility.

Lavy, et al. (1993) estimated both the intensity of treatment and the choice of treatment in Ghana. They used the 1987 Ghana Living Standard survey (GLSS) data. They computed hedonic price variable that they used in their estimation. The results showed that the price variable significantly affects the number of consultations and the intensity of treatment as well as the kind of quality chosen. Those with more serious illnesses or injuries are more likely to choose a greater intensity of treatment. The choice of quality of treatment is highly responsive to travel time to the health facility.

They also established that the choice between professional consultation and self-treatment is highly responsive to household income. The probability of seeking professional treatment, *ceteris paribus*, increases with income at decreasing rate. Their results further showed that the elasticity of intensity of treatment is small but rises with intensity of treatment. The elasticity of choice of treatment are larger. Substitution between patient care in hospitals and treatment at clinics is responsive to variation in accessibility and price. The cross-price elasticity for price and time are highly but small.

Litvack et al. (1993) studied the demand for health care services in Cameroon. The purpose of their study was threefold, that is to confirm findings that user fees plus quality improvement leads to higher utilization, to examine changes in patient mix resulting from implementation of the policy; and to study behavior of the poor people when fees are charged and quality is improved. They confirmed earlier findings that user fees impacts negatively on the poor people through reduction in utilization of health care services. The study also found that quality of care is a significant factor in influencing demand.

The study by Litvack et al (1993) was done in Cameroon during implementation of a Bamako Initiative (BI) type program in late 1990. The implementation of the program provided an opportunity for a natural experiment. The experimental design of the study was possible because of the ministry of health's gradual implementation of its new policy called Reorientation Approach to Primary Health Care. The design of the experiment was that of "pre-test, post-test control group". The study used three treatment health center areas where fees and quality policy would be used and two control health center areas where fees and quality policy would not begin in the first phase. The quality component of the policy was that of change from no drugs at the health centers to a full steady stock. Before the BI type policy consultation and treatment was free in Cameroon.

The authors used logistic regression analysis to test if the probability of using the health center differs across control and treatment groups and by the patient's income.

The results of their study confirmed earlier findings on the effect of distance on utilization, that is distance is significant, implying that those people who live further away from the health center have smaller probability of attending than those who live closer. Income in highly significant for the lowest quintile and becomes increasingly less significant as income increases. The probability of seeking care at the health center when sick increases significantly when the fees-plus-quality policy was introduced. However the probability is not affected equally across income groups. The poor are more likely to seek/use the health center after the policy was implemented contrary to Gertler et al (1987) assertion.

The results also indicated that the probability of population using the health center increased significantly after introducing fees and quality improvements. They concluded that use of the health center by the poor in Cameroon increased proportionately more than other groups because the fees were introduced along with improved quality of health care which represented an effective decrease in the price of quality care.

Dow (1999) was concerned with the specifications commonly used in the estimation of health care demand with discrete data and their consistency with utility maximization. The paper focuses on the specification and interpretation of models that allow prices of different choices to have different estimated coefficients.

Dow argued that when price elasticity is the policy parameter of interest, flexible models that allow price coefficients to vary by alternatives should be estimated. Such models can be given structural interpretation.

To examine the effects of price coefficient constraint on price elasticity, Dow used the Cote d'Ivoire LSMS data analyzed by Gertler et al 1990. He estimated two models. In the first model the price coefficient was constrained to equality across options while in the second model the price coefficient was allowed to vary across options.

The results of the first model showed that hospital price elasticity was almost double the clinic figure of –0.24. When the price coefficient was allowed to vary with alternative in

the second model, clinic price elasticity remained invariant but hospital price elasticity dropped by more than half. The likelihood ratio also showed a rejection of the restriction in the first model. The results therefore showed that price elasticity estimates could be sensitive to constraints on alternative-specific price coefficients.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Theoretical Framework

The theoretical framework employed in this study is that developed by Dow (1995). Previous literature state conditional utility as additively separable function of health and non-health consumption. Income and price coefficients in the resulting indirect utility function have been constrained to equality across alternatives. In this study we specify the conditional utility function with an interaction term between health and non-health consumption. This allows the price coefficient to vary from one option to another.

To further add flexibility to our model, we include a parameter representing the budgeting period for the income from which the health care price is subtracted. This parameter is essential because if the annual income is used in estimation but health care expenses are budgeted from monthly income, the income and price elasticity would be incorrect when the budgeting parameter is not included. As we estimate a conditional utility model that is quadratic in consumption, the empirical effect of modeling an unobserved income parameter λ is to allow the quadratic consumption term's income and price coefficients differ, that is $\alpha_2(\lambda Y_i - P_j)^2$ expands to $\alpha_2 P^2_j - 2\alpha_2 \lambda P_j * Y_i$ thus making the model more flexible. The quadratic consumption term produces a nonlinear price term that enhances predictive power of the model.

Another development that we incorporate in this study is cross-price effects on utility. This is done through specifying the indirect utility model with a price P_k term. The rationale for including this term is that we assume forward-looking behavior. The

interpretation of this is that of a person's choice to visit a clinic today depending on the price of referral visits to hospitals tomorrow. Dow (1995) has shown that modeling this effect does not require explicitly specifying the dynamic objective and budget constraints and that the price of alternative **k** can be another element of the price vector of "other" goods (see McFadden 1981).

If we let $E[q^k_j]$ be the probability of future visit to provider **k** following today's healthcare choice **j**. the expected health improvement $Q_{j,\ t+1}=E[H_{j,t+1}-H_{j,t}]$ in the next period after choice **j** may then enter utility directly. A next-period future consumption term may similarly be specified, thus $C_{j,\ t+1}=\lambda Y_i - E[q^j_j]P_j - E[q^k_j]P_k$

Travel time is to be estimated as a separate variable i.e. to have choice specific coefficients. The hustles of traveling to get medical treatment may cause health of the patient to deteriorate further. The importance of this effect depends on how well the type of the facility can treat the health problem. This is captured by an interaction of travel time with choice specific intercept Q_{tj} for the incremental health deterioration associated with travel stresses. The empirical implication of this is that travel time may be specified as impacting utility apart from the opportunity cost of time and the estimated effect may vary across alternatives.

3.2 Theoretical Model

When a member of a household is ill or injured, the patient must not only decide whether to seek medical care but also the type of care. The patient is faced with a set of alternative

providers from which to choose. Each provider has a different potential impact on an individual's health. In essence individuals are faced with a discrete choice decision. The consumers of health care are assumed to be utility maximizers. Thus the patient chooses the option (provider) that yields the highest utility possible.

Utility is a function of health and non-health consumption. Thus direct utility **U** conditional on choice **j** (**j** from set **J** of discrete health care demand choices) is specified as;-

$$U_j = u(H_j, C_j) \text{----------} (1)$$

Where H_j is expected health status after receiving treatment from provider j, C_j is consumption of non-health care after paying provider j. The level of non-health consumption conditional on choosing provider j is derived from the budget constraint. Thus;-

$$C_j = Y_i - P_j \text{----------} (2)$$

Where Y_i is annual household income and P_j is provider j's price. Substituting (2) in (1) yields:-

$$U_j = u(H_j, Y_i - P_j).$$

Based on this information, the utility maximization problem is specified as:-

$$U^* = \max(U_1, U_2, \_\_\_, U_J),$$

Where U* is the highest utility the individual can attain.

3.3 Model Specification

Maximizing the unconditional utility functions yields a system of demand functions whose forms are probabilities that the particular alternatives are chosen. The demand function for a provider is the probability that the utility from that alternative is higher than the utility from any of the other alternatives.

The empirical model can be specified as: -

$$U_{ij} = \alpha_1 C_{ij} + \alpha_2 H_{ij} + \alpha_3 C^2 * H^c{}_{ij} + \alpha_4 E[H_{ij}] + \alpha_5 E[C_{ij}] + \epsilon_j \quad \text{----------(3)}$$

Where U_{ij} is the direct conditional utility that individual **i** expects from health care provider **j** ; C_{ij} is the consumption of non-health goods ;H_{ij} is the expected health improvement in health status for individual **i** after receiving treatment from provider **j**, $E[H_{ij}] = Q_{j,t+1}$ is the expected health improvement in the next period following choice **j**, $E[C_{ij}]$ is the next-period future consumption and ϵ_j is a zero mean random taste disturbance with finite variance and is uncorrelated across individuals and alternatives. The amount of non-health care goods consumed depends on choice **j** because of the monetary and non-monetary costs of treatment from provider **j**.

Note that both C_{ij} and H_{ij} are unobservable. To make them observable and facilitate empirical work, we specify that-

$$H_{ij} = H_{i0} + Q_{ij} \quad \text{---------- (4)}$$

and

$$C_{ij} = \lambda Y_i - P_j \quad \text{---------- (5)}$$

Where λ is budgeting period parameter.

From (4), H_{i0} is individual i's initial health status before receiving treatment from provider j and Q_{ij} is the health improvement from health care choice j. We further specify the health production function as depending on a vector of choice-specific access characteristics as well as a vector of individual characteristics eg education, sex, etc. Thus:-

$$Q_{ij} = Q^{b}_{0j} + Q^{c}_{ij} Z_j + Q^{x}_{2j} X_i + \xi_j \text{----------(6)}$$

Where Q_{0j} captures unobserved elements of each choice j; Z_j is a vector of observable choice-specific attributes and X_j is a vector of observable socioeconomic attributes of individual i and ξ_j is a random shock that represents unobserved individual characteristics such as severity and complexity of illness.

To ease econometric work we assume the elements of health specified to enter the consumption interaction term in equation (1) are restricted to zero except for the alternative-specific intercepts i.e.

$$H^{c}_{ij} = Q^{c}_{ij} \text{----------(7)}$$

From (5) C_{ij} is the monetary value of non-health care goods that individual i consumes after paying for medical care received from option j ; Y_i is annual income of individual i; P_j is the value of monetary resources that individual i expends on medical care received from provider j.

Substituting the system of equation (4)-(7) in equation (3) yields an indirect utility function of the form:

$$V_{ij} = \alpha_1(\lambda Y_i - P_j) + \alpha_2(H_{i0} + Q^b_{0j} + Q^c_{1j}Z_j + Q^x_{2j}X_i) + \alpha_3(\lambda Y_i - P_j)^2 * Q^c_{ij} + \alpha_4 E[H_{ij}] + \alpha_5(\lambda Y_j - E[Q^j_j]P_j - E[Q^k_j]P_k) + \xi_j \quad \text{---(8)}$$

The initial health status H_{i0} does not vary across choices and its effect is not specified as differing across choices. It can therefore be omitted from the indirect utility specification. Similarly the linear and quadratic income terms are dropped leading to the estimating equation:-

$$U_{ij} = V_{ij} + \xi_j \quad \text{---(9)}$$

where

$$V_{ij} = \beta_{0j} + \beta_{1j}Z_j + \beta_{2j}P_j + \beta_{3j}X_i + \beta_{4j}P^2_j + \beta_{5j}P_j * Y_i + \beta_{6j}P_k$$

Where

$$\beta_{0j} = \alpha_2 Q^b_{0j} + \alpha_4 [Q_{j,t+1}]$$

$$\beta_{1j} = \alpha_2 Q^c_{1j}$$

$$\beta_{2j} = -\alpha_1 - \alpha_5 E[Q^j_j]$$

$$\beta_{3j} = \alpha_2 Q^x_{1j}$$

$$\beta_{4j} = \alpha_3 Q^c_{ij}$$

$$\beta_{5j} = -2\alpha_3 Q^c_{ij}\lambda$$

$$\beta_{6j} = -\alpha_5 E[Q^k_j]$$

Not that equation (9) includes a term in the price of alternative k to take into account cross-price effects.

Most of the existing studies on the demand for health care in developing countries have assumed that the demand function take on multinomial logit (MNL) form (see for

example Mwabu et al. (1993). MNL suffers from the assumption of independence of irrelevant alternatives (IIA) (Gertler et al. 1990). The assumption of IIA implies that the disturbance shocks (stochastic portions) of the conditional utility functions are uncorrelated across alternatives. The assumption also imposes the restriction that cross-price elasticity is the same across alternatives. However Mwabu et al. (1993) proceeded with the assumption of IIA arguing that there is no a prior way of determining the correct decision structure of patient.

Another specification form that demand functions can take besides the MNL is the NMNL. Nested multinomial logit is increasingly becoming popular among health care demand researchers as evidenced by most recent papers (Dow 1999, David E. Sahn, and Puig-Junoy et al. 1998). This is so because NMNL offers some computational and predictive advantages over MNL. The NMNL allows grouping of more similar alternatives so that it relates the assumption of IIA across the groups but not within groups. This means that the NMNL allows for correlation across sub-groups of alternatives. It also means that cross-price elasticity is non-constant and more elastic within groups than across sub-groups.

In this paper, our health care provider choices are grouped in one single group. This restricts our demand functions to MNL specification the IIA problem not withstanding. To minimize its effects, however, Dow (1995) has shown that introducing cross-prices into the model (as we have done here) is an alternative way besides the NMNL to relax the IIA assumption.

Following Gertler et al. (1990), we assume that the joint distribution of ϵ_j and ξ_j is a type B extreme value distribution. We also let choices 1, 2, -, -, -, J be the various provider alternatives.

The probabilistic demand for provider **j** is

$$\Pi_j = exp(V_j)/\Sigma^{J}_{k=1} exp(V_k) \text{----------(10)}$$

Estimation of equation (10) requires use of numerical methods to find values of parameter vectors β that maximize the likelihood (or log-likelihood) of observing the sample data on choice attributes that an individual faces in choice j and on individual characteristics. The log-likelihood function that needs to be maximized is given by:-

$$lnL_i = \Sigma_i \Sigma_j D_{ij} \ln \Pi_{ij} \text{----------(11)}$$

where D_{ij} is a dichotomous variable that takes on the value 1 if individual **i** chooses alternative **j**.

3.4 Description of Data

This study utilizes the Welfare Monitoring Survey WMS (III) data which was collected in 1997. The survey information was obtained on basis of survey clusters into which they had been organized. Both urban and rural clusters were surveyed. Since the focus of this study is on the factors influencing demand for health care services, we disregard the

urban sample because one of the factors believed to influence demand is less important in urban setup due to close proximity of health providers to one another.[1] We therefore limit our study to the rural sample. In the rural areas of Kenya, health care providers of all kinds are located sparsely making measurement of travel-time distance reasonably possible. WMS III is suitable for this study. It is a multipurpose survey conducted on the broad outlines of the Living Standard Measurement Surveys (LSMS).

The rural sample consists of 8963 households with a total of 44063 members. Of this number of individuals, 86.2 per cent (37983) did not report illness or injury in the last 4 weeks prior to interview. The remainder 13.8 per cent (6080) reported having been ill (or injured) over the same period and sought treatment from different health care providers. This figure includes those who sought treatment from various providers as well as self-treatment. We further reduce the figure by excluding those patients who reported medical expenditures other than doctor and hospital expenditures. Patients who reported having self treated and yet reported doctor and hospital expenditures are also dropped from the sample. We then arrive at a final sample of 4086 patients whose composition by type of provider is given in table 3 of facility utilization patterns.

An analysis of the types of health care providers from which treatment was sought revealed 8 kinds of alternatives:- private dispensary, public dispensary, community health center, private hospital, mission hospital/dispensary, government hospitals(provincial and district hospitals) private doctor/dentist, and self-care (those who consulted pharmacists,

[1] Travel-time distance to facility has been shown to affect demand for health care Mwabu et al (1993).

drugstores, chemists, traditional herbalists, faith healers etc). For the purpose of this study private doctor/dentist option is merged with the private dispensary alternative.

The number of visits to health care providers was grouped into classes, 1-3 visits, 4-5 visits, and 6 and above visits. From these classes, it is not possible to obtain a record of the first visit to a health provider for the individuals in an attempt to cure illness. Hence we are forced to use the mid-class values as mean value for the number of visits. We then compute the cost of treatment per visit (price) using the means.

Demographic and socioeconomic characteristics of households and individuals were also captured in the survey. These characteristics are thought to influence demand for health care. They include age, sex, income, education, days sick, and size of household. Income was not captured directly in this survey. Instead household expenditures for the last month were obtained. In this study we use household expenditure data as proxy for income.

Information about health care facility attributes[2] collected in the survey include travel-time (measured in minutes) and cost of treatment. Three types of travel-time were measured in the survey. These are:- time taken to reach the nearest qualified doctor, time taken to reach the nearest dispensary/community health center, and time taken to reach the nearest inpatient (district/regional) hospital. Thus information about travel-time to specific health care providers is not directly available. This posed difficult problem. To alleviate the problem, we assumed that travel-time to dispensary/community health center

[2] All information on health facility attributes was collected in the household survey. No independent survey on health facilities was conducted.

recorded in the survey applies to the three health clinic types. Similarly recorded travel-time to inpatient hospitals applies to the three hospital types.

The cost element was even more problematic. Four kinds of expenditures were recorded in the survey. These are - doctor's expenditure, medicine expenditure, hospital expenditure, and other medical expenditure. The problem was that patients who were treated in the clinics reported spending on hospital care. Similarly patients who were treated in hospitals reported spending on clinic care also. To solve this problem, we assumed that all reported costs of treatment were associated with the type of health care alternative visited. Further we exclude 'medicine expenditure' and 'other medical expenditure 'cost elements from the sample. The survey did not collect information about quality of health facilities such as availability of drugs, cleanliness, personnel numbers and qualification, and availability of equipment[3].

3.5 Description of Variables

The model specification used in this study is a polychotomous dependent variable model. There are seven dependent (response) variables denoting health care provider alternatives- both government and private dispensaries and hospitals, and community health center. Self-treatment is the comparison alternative.

[3] A detailed survey of health care facilities is necessary to capture all the information rather than relying on an household survey.

Table2-Variable Description

Variable	Description	Expected sign
Age	Age of household member	Indeterminate
Sex	Gender(1=male; 0=female)	Indeterminate
Education	Education(0=pre-primary;1=primary;2=secondary;3=tertiary)	Indeterminate
Daysick	No. Of days household member has been sick	Indeterminate
Income	Income per household	Positive
Size	No.of household members	Indeterminate
Ttd	Travel time to dispenasry/community health center	Negative
Tth	Travel time to hospital	Negative
Pj	Price of provider j	Negative
PK	Price of alternative k	Indeterminate

The vector $\mathbf{X}_i$ of individual and household characteristics is given by the following variables: age, sex, education, daysick, income, and size. Table1 shows the labels and the description of the variables. Age (a continuous variable) proxies the depreciation of health capital as well as individuals' preferences towards health care. Similarly sex (a categorical variable) affects health capital depreciation. Education affects preferences and the characteristics of each provider knowledge level. Four levels of education were distinguished: pre-primary, primary, secondary, and tertiary. Days sick proxy intensity of sickness. Income was not included in the survey. Instead income level was proxied by household expenditure in the previous month prior to interview. Size of household (a continuous variable) affects the frequency of seeking treatment. Travel time to and price (costs per visit) of provider affects the choice of provider.

3.6 Estimation Procedure

The focus of this study is to determine the factors that affect the probability of seeking medical treatment by sick individuals and the elasticity of demand with respect to the

explanatory variables. To achieve this end, we carry out maximum-likelihood estimation (MLE) of a multinomial logit using Stata^{R} program.

3.7 Expected Sign of Empirical Coefficients

It is of interest to know a priori whether the expected signs of policy variables may be affected by allowing flexible specification. One of the important differences from the fixed (parsimonious) model is that the prices of different alternatives may have very different effects although all are expected to decrease own demand. In our model specification, travel enters estimation through health production rather price. The effect of travel time on demand may differ by alternative if disutility of traveling is altered following pain relief from a care visit. The expected sign of empirical coefficients of all the other variables relating to individual and household characteristics are indeterminate a priori

To show how price effects may differ by health care provider alternative through the consumption- health interaction in the utility function, we consider the following equation that gives the marginal effects of change in the price of alternative **j** (see equation (9)).

$$dD_k/dP_j = D_j D_k(\beta_{2j} + 2\beta_{4j}P_j + \beta_{5j}Y_i - \beta_{6j})$$

$$= d_j D_k\{[-\alpha_2] + [-\alpha_5(E[Q^j{}_j] - E[Q^k{}_j]) + [-2\alpha_3(Q^c{}_{ij}\lambda - Q^c{}_{ij})] \quad \text{----------(12)}$$

The first and third terms in square brackets are negative if α_1 and α_3 are positive and the second negative if visits to provider **j** generate more follow-up visits to facility **j** than do

visits to **k**. If $E[Q^j_j]-E[Q^k_j]$ were sufficiently negative i.e. if to visits to provider **j** generate less follow-up visits to facility **j** and more visits to **k**, health would not be a normal good.

For travel time,

$$dD_j/dT_j=(dD_j/dP^T)\delta^* w+D_jD_k\beta_{6j} \quad \text{---------- (13)}$$

where $(dD_j/dP^T)\delta w$ is price marginal effects' of travel time. When price is specified without $)\delta w^*T$ component, then:

$$dD_j/dT_j= D_jD_k\beta_{6j} \quad \text{---------- (14)}$$

The sign of cross-price elasticity may be positive or negative, as the second term in the equation below cannot be signed a priori;-

$$dD_j/dP_j=D_jD_k[\beta_{6j}-(\beta_{2k}+\beta_{4k}+\beta_{5k})$$
$$=[\alpha_1]+[-\alpha_5(E[Q^k_j-E[Q^j_j])+[-2\alpha_3(Q^c_{ij}-Q^c_{ij}\lambda)] \quad \text{---------- (15)}$$

CHAPTER FOUR: EMPIRICAL RESULTS

4.1 Descriptive Statistics

The rural sample used in this study consists of 4086 observations of individuals who reported illness and sought treatment from different health care providers as well as self-treatment. Of these individuals, 735 visited private dispensaries, 892 were treated at public dispensaries, while 357 were treated at community health centers. The other figures are 158, 389, and 333 who sought treatment from private, government, and mission hospitals respectively. The remainder 1222 reported having treated themselves. This category consists of patients who bought drugs from pharmacists and drugstores. It also includes those who consulted traditional or/and faith healers. Those who reported "self-treatment" are also in this group. Table 3 shows utilization patterns by type of facility used.

Table 3: Facility Utilization Patterns

Type of Facility	No. of Patient	Percentages
Private Dispensary	735	17.98
Government Dispensary	892	21.83
Community Health Center	357	8.73
Private Hospital	158	3.86
Government Hospital	389	9.52
Mission Hospital	333	8.14
Selftreat	1222	29.90

The descriptive statistics for the mean values of choice-specific variables and individual and household characteristics used in this study are given in the Table 4.

Table 4: Determinants of service utilization patterns (Std. Errors in parentheses)

Variables	Private dispensary	Government dispensary	Community health center	Private hospital	Government hospital	Mission hospital
User fees (KShs)	316	168	242	1494	306	562
User fees squared (KShs)	99,856	28,224	58,564	2,232,036	93,636	315,844
User fees*Income (KShs)	1,327,832	705,936	1,016,884	6,277,788	1,285,812	2,361,524
Travel time to facility (min)	40	40	40	50	50	50
Income (KShs)	4204	4204	4204	4204	4204	4204
Gender (1=male)	0.45	0.45	0.45	0.45	0.45	0.45
Education	2.08	2.08	2.08	2.08	2.08	2.08
Age (years)	20	20	20	20	20	20
Size of household	5	5	5	5	5	5
No. Of days sick	13.4	13.4	13.4	13.4	13.4	13.4

Among the three dispensaries/clinics, patients faced highest monetary cost of treatment in private dispensaries amounted Ksh 316. The cost of treatment in community health centers was Ksh 242 while in government clinics patients paid a fee of Ksh 168. These results are by no means unexpected. Private dispensaries/clinics are motivated by profit maximization and hence the costs of treatment are high. Private hospitals on average charged a fee of Ksh 1494 while mission and government hospitals charged Kshs 562 and Kshs 306 respectively.

Travel-time to health facility by patients is an important element influencing demand for health care services. Patients lived closer to dispensaries/clinics than hospitals. On average

it took patients 40 minutes to reach a dispensary/clinic of each type. The travel-time to hospitals of all types is on average 50 minutes. Hospitals, being the referral facilities require larger threshold/sphere of influence and are therefore located in major market centers/towns that are farther apart.

The mean values for individual and household socioeconomic characteristics indicate that patients were on average 20 years old and had several years of primary school education. The size of households was 5 members while household income averaged Ksh 4202. Slightly more than half (58.2 per cent) of the patients were females and male patients constituted the remainder 41.8%. Community health centers have the lowest variability in user charges of 1.52 followed by government dispensary with a standard error of 4.32. Among the dispensaries/clinics, private dispensaries had the widest variability in user charges of 49.14. Private hospital user charges show a standard error of 47.78 that closely compares to private dispensary. Mission hospitals show the widest variability in user charges of 109.6. Government hospital user charges show a variability of 16.52. The standard errors for individual and household characteristics show minimal variability except income that varies widely from one household to another.

Table 5: Utilization of Health Facilities by Gender

Health Care Provider	Male		Female		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Private dispensary	322	7.88	413	10.10	735	17.98
Government dispensary	432	10.57	460	11.25	892	21.83
Community health center	169	4.03	192	4.69	357	8.73
Private hospital	67	1.63	91	2.22	158	3.86
Government hospital	190	4.65	199	4.87	389	9.52
Mission hospital	143	3.49	190	4.65	333	8.14
Total	1319	32.28	1545	37.81	2864	70.09

Pearson Chi-Squared =5.22683 with 5 degrees of freedom and probability of 0.384
Source: Own compilation

Table 5 shows distribution of individuals by type of provider. The percentages of males and females per health service appear minor but the Chi-squared test indicates dependence between health facility and gender.

4.2 Estimation results

Maximum likelihood estimates of demand parameters were obtained for the model. The model is specified to include all the explanatory variables discussed under description of variable section.

Estimation results are shown in the table 6 below. Income exerts a negative effect on the probability of seeking medical care from all the professional health care options except mission hospital and private dispensary relative to self-care. However the effect is very weak. The income effect is statistically significant for all health care providers at the 5% significance level. Similarly educational attainment is an important factor contributing

positively to the demand for medical care by sick individuals. In all six professional health care provider alternatives, the level of education exerts strong positive effects. Educated individuals seek medical care among professional providers more than do uneducated members of society. The coefficient on education shows that educational attainment is significant for private and government dispensaries and community health center. It is significant for government, private and mission hospitals. Size of household has a strong negative effect on the probability of seeking medical care from all the professional providers except mission hospital relative to self-care and statistically significant for all dispensaries and community health center and all hospitals at the 5% level of significance. The age of household member has weak positive effect on demand among all hospital types and statistically significant for all of them. The effect of age on demand is weak and negative among the dispensaries and the community health center. It is statistically significant in all of them. The coefficient on gender is positive for the government and mission hospitals and private and government dispensaries and community health center. It is negative for the private hospital and only insignificant for private hospital and private dispensary. It is significant for the rest of providers. The positive gender coefficients indicate that more men seek medical care from the dispensaries/clinics and government and mission hospitals compared to self-treatment than do women. As for private hospital, more women are likely to seek care compared to self-treatment than do men.

The coefficient of price in the dispensaries and community health center and the hospitals is negative as expected. The effect is however weak. Note that the price effect is a combination of structural parameters α_1 and α_5 whose effects cannot be determined

separately. Price is statistically significant for all the professional health care providers at the 5% level of significance.

Travel time coefficients are positive in all cases and significant for all hospitals and dispensaries and the community health center. This means that each alternative produces health that overrides the disutility associated with traveling to reach the facility. The coefficients on the square of price are positive for all the alternatives as expected. The coefficients on the price-income interaction term are also negative as expected.

Table 6: Maximum Likelihood Estimation Results

Variables	Private Dispensary	Government dispensary	Community health center	Private hospital	Government hospital	Mission hospital
Constant	-2.575184 (.0909065)	-2.073417 (.079875)	-3.195771 (.1161842)	-4.604842 (.1746444)	-3.77031 (.1100042)	-3.952468 (.1156501)
User fees (KShs)	-.001188 (.0000622)	-.001144 (.0000578)	-.0012541 (.0000845)	-.0011327 (.0001031)	-.000064 (.0000601)	-.0000811 (.0000633)
User fees squared (KShs)	9.21e-07 (5.69e-08)	9.19e-07 (5.66e-08)	9.18e-07 (6.10e-08)	9.17e-07 (5.99e-08)	3.32e-08 (4.59e-08)	1.45e-08 (3.20e-08)
User fees*Income (KShs)	-3.25e-07 (2.13e-08)	-3.25e-07 (2.12e-08)	-3.24e-07 (2.28e-08)	-3.24e-07 (2.23e-08)	-1.20e-08 (1.72e-08)	-4.74e-09 (1.20e-08)
Travel time to facility (min)	.0911066 (.0081578)	.0822625 (.0076875)	.1161821 (.0104038)	.0797877 (.0138142)	.0303341 (.0097785)	.0518829 (.0104657)
Income (KShs)	.000017 (2.80e-06)	-4.69e-06 (3.72e-06)	-4.10e-06 (5.00e-06)	-.0000448 (.0000123)	-.0000405 (7.97e-06)	8.93e-06 (3.57e-06)
Gender (1=male)	.0005669 (.0390072)	.213922 (.0369019)	.1009477 (.0486414)	-.0027343 (.0660458)	.2693169 (.0465925)	.010246 (.0497428)
Education	1.260307 (.0407455)	1.089465 (.0370145)	1.094347 (.0517178)	1.313717 (.0714505)	1.299521 (.0477826)	1.212103 (.0509469)
Age(years)	-.0016122 (.0009545)	-.0058101 (.0009332)	-.0067873 (.0012643)	.0159867 (.0014452)	.0083503 (.0010812)	.0052817 (.0011694)
Size of household	-.0462916 (.0067863)	-.029581 (.0063784)	-.0073045 (.008388)	-.0241257 (.0110812)	-.0184884 (.0078228)	.0118902 (.0080866)
Log likelihood	-46898.29					
No. of observations	4086					

Source: Own compilation

4.3 Indirect utility and probabilistic demand estimates

From the results of the maximum likelihood estimation given in table 6 above, indirect utility and the basic probabilistic demand estimates for the various health care provider alternatives are calculated and presented in table 7 below.

Table 7: Utility and probabilistic demand estimates

	V	exp(V)	$\sum_{k=1}^{J} \exp(V_k)$	$\frac{\exp(V)}{\sum_{k=1}^{J} \exp(V_k)}$
Private dispensary	-0.06134	0.940503	3.042452	0.309127
Government dispensary	0.188636	1.207601	2.775354	0.435116
Community health centre	-0.77198	0.462097	3.520858	0.131246
Private hospital	-0.78749	0.454985	3.52797	0.128965
Government hospital	-0.62936	0.532933	3.450023	0.154472
Mission hospital	-0.95494	0.384835	3.59812	0.106955
		3.982955		

Among the dispensaries and community health centre, government dispensaries have the highest demand. This could probably be explained by the fact that they charge the lowest fee among the peers. Private dispensaries follow second in demand while community health centres are demanded least in this category. Among the hospital category, government hospitals exhibit the highest demand followed in second position by private hospitals. Like the government dispensaries, government hospitals charge the lowest fee in the hospital category and this could probably explain the high demand. Mission hospitals have the least demand.

4.4 Elasticity Estimates

Elasticity of demand for health care for each option is given in the table 8 below. Demand is price inelastic whenever the percentage change in price leads to a smaller percentage change in quantity demanded. This gives price elasticity of demand (PED) values between 0 and –1.Demand is price elastic whenever the percentage change in price leads to a larger percentage change in quantity demanded. This gives PED values between –1 and –infinity. With exception of private hospital whose price elasticity of demand is elastic, the price elasticity of demand for health for all other providers is inelastic.

The formula for price elasticity of demand (PED) is

$$\frac{\%\text{ change in quantity demanded}}{\%\text{ change in price of the good}}$$

Table 8: Elasticity of Demand

	Elasticity of Demand					
With respect to	Private dispensary	Government dispensary	Community health center	Private hospital	Government hospital	Mission hospital
Income	0.013858	0.00179	0.001671	-0.01818	-0.0164	0.00795
Own fee	-0.36844	-0.19035	-0.29894	-1.55685	-0.01948	-0.0455
Distance to own facility	0.478495	0.407889	0.614119	0.539026	0.191409	0.338193
Government hospital fee	0.00341	0.00374	0.00295	0.00294	-0.01948	0.00289
Government dispensary fee	0.07613	-0.19035	0.06572	0.06558	0.06708	0.06429

Own-price elasticity of demand for medical treatment in government dispensaries is largest compared to private dispensary and community health center. A 1 per cent increase in user charges would decrease demand at government dispensary by 0.19%, while the fall in demand for medical treatment at private dispensary and community health center is 0.368% and 0.299% respectively. With regard to hospitals, government facilities have the highest elasticity of demand compared to private and mission hospitals. This means that demand for medical care in government hospital is less sensitive to increase in user charges than in private and mission hospitals. A 1 per cent increase in user charges reduces demand for medical care at government hospital by 0.02% while the fall in demand with regard to private and mission hospitals 1.56% and 0.05% respectively. The demand for medical treatment is also sensitive to the travel time to the respective facility. The elasticity of for health care with respect to time distance is positive for all types of providers. This means that each provider's health production outweighs the disutility associated with traveling to reach the facility. Among the dispensaries and community health centers, community health centers have the highest elasticity followed by private dispensaries with government dispensaries having the least elasticity. In the hospitals category, private hospitals have the highest elasticity followed

by mission hospitals with government hospitals having the least elasticity. A probable explanation could be that private hospitals produce higher health due to their better equipment and personnel than mission and government hospitals.

Income elasticity of demand (YED) measures how demand reacts to changes in income. The formula for income elasticity of demand is:

$$\frac{\%\text{ change in quantity demanded}}{\%\text{ change in income}}$$

Income elasticity of demand is positive for all dispensaries and community centers and highest for private dispensary. In the hospitals category, only mission hospitals have positive elasticity of demand. Both private and government hospitals have negative income elasticity of demand. A 1 per cent rise in income would raise demand for health care in private and government dispensaries and community health centers by 0.014%, 0.002%, and 0.002% respectively. In the hospitals category, while a 1 per cent rise in income would increase demand for health care services for mission hospitals by 0.008, it would reduce demand for health care services for both private and government hospitals by 0.02%.

Cross price elasticity of demand (XED) measures how demand reacts to changes in the price of other goods. The formula for cross price elasticity of demand is:

$$\frac{\%\text{ change in quantity demanded of main good}}{\%\text{ change in price of other good}}$$

Cross elasticity price of demand with respect to government dispensary and hospital fees are positive in all cases indicating that the facilities are substitutes in provision of health care services. The cross price elasticity is higher with respect to government dispensary fee than with respect to government hospital fee. However, among dispensaries and

community health centers, the cross price elasticity of demand with respect to government dispensary fee is highest for private dispensaries meaning that private dispensaries are closer substitutes than the rest of facilities.

4.5 Simulation Results

In this section we carry out simulations to determine the effects of various public policies on demand for medical care in both government and private health care providers in rural Kenya. The public policy whose effects we simulate is increasing fees in government health facilities by a 100 % i.e. doubling fees. Simulation results of percentage changes as a result of this policy are presented in the table below.

Table 9: Simulation results (percentage changes in demand)

Policy	Private dispensary	Government dispensary	Community H. Center	Private Hospital	Government Hospital	Mission Hospital
Double government hospital fee	0.0341%	0.0374%	0.0295%	0.0294%	-0.1948%	0.0289%
Double government dispensary fee	0.7613%	-1.9035%	0.6572%	0.6558%	0.6708%	0.6429%

Base probabilities are the proportion of the sample predicted to choose each treatment option. Individual policy probabilities are proportions of the sample predicted to select each treatment alternative upon implementation of the particular policy.

The results of implementing the policy show that the probability of selecting government hospital decreases by 0.19485%. The probability of selecting government dispensary decreases 1.9035%. This means that for every 1000 population, about 2 people would find it difficult to afford use of government hospitals while the number of those who would find it difficult to afford government dispensaries is about 19. Those who find it difficult to afford treatment in government facilities would instead seek treatment from the other type of health care providers. It is also evident that raising fee in government dispensaries would discourage self treating patients from ever seeking treatment in these facilities. The effects of the policy on demand for health care services from non-government facilities show that there is increase in demand in these facilities.

CHAPTER FIVE: SUMMARY AND CONCLUSION.

This paper has employed flexible model of demand for health care services to empirically examine the effects of cost sharing on utilization of medical facilities in rural Kenya. The model allows choice specific price coefficients.

The results indicate that the price of different alternatives may have very different demand effects. With an exception of community health center, demand for health care by women falls below that of men in all the other facility types. Only in community health center does demand for health care by women exceed that of men. Therefore there is need to establish factors that hinder women from accessing health care and put in place policies that would foster greater women participation in seeking medical care.

Among the dispensaries and the community health centers, income elasticity of demand is generally very low. In the hospital category, income elasticity of demand is also low for government and mission hospitals but high for private hospital. This is probably because the rich have high propensity for seeking medical care from private hospitals. For all government facilities, income elasticity of demand is negative. This is also the case with mission hospital. This means that government health facilities are of lower quality relative to their private counterparts. The government should therefore revamp its health care facilities during the on-going reforms of the health sector. Measures that can improve the state of government health facilities include; provision of drugs, employment of qualified and motivated staff, and provision of medical equipment and supplies.

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